April 1974 B73-10515

NASA TECH BRIEF

Goddard Space Flight Center

Corrugated Battery Electrode

The problem:

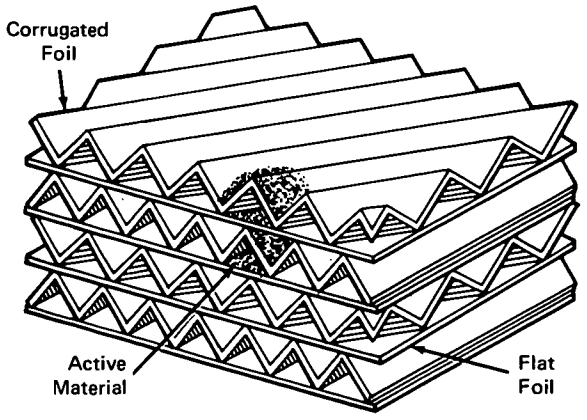
In conventional sintered nickel plaques used as supports in nickel cadmium and nickel zinc batteries, the pores are not uniform in size or in shape and are interconnected randomly. Because of this randomness, the active material used in battery electrodes made from such supports cannot be coated uniformly throughout. Thus, such electrodes are rather inefficient and can terminate the service life of batteries prematurely.

The solution:

The performance of porous electrodes in batteries and other electrochemical cells is greatly improved when the supports for the active material have pores of uniform size, extending completely through the electrodes, from side to side, with no interconnections between the pores.

How it's done:

A typical electrode (see figure) comprises a porous conductive support. The support is a bonded stack of pieces of thin corrugated nickel foil, with the corrugations oriented perpendicularly to the sides of the electrode to form an array of passages through the electrode. An active material is distributed uniformly within the passages. The support also comprises pieces of thin flat metal foil between adjacent pieces of the corrugated foil, with each piece of the flat metal foil forming a barrier between the passages formed on each side of it. The adjacent pieces of foil are bonded at all contiguous points, so that each passage is isolated from every other passage.



Electrode Construction

The corrugations in the alternate layers are oriented approximately in the same direction. The corrugations in the odd corrugated layers are oriented at a small angle from the perpendicular in one direction, and the corrugations in the even corrugated layers are oriented at a small angle from the perpendicular in the opposite direction.

The electrode is rechargeable where the support is made of inert conductive material. Typically, the inert material consists of nickel and the active material consists of cadmium hydroxide or nickel hydroxide.

The corrugated foil is about 0.3 to 1 mil (0.008 to 0.03 mm) thick, and the flat foil is about 0.2 to 1 mil (0.005 to 0.03 mm) thick. The corrugations are triangular in cross section, with each corrugation about 2 to 6 mils (0.05 to 0.15 mm) high and 2 to 10 mils (0.05 to 0.25 mm) wide; the height of each corrugation is at least about one-half its width. The density of the support is less than 25 percent, and the density of the electrode is less than about 55 percent.

(continued overleaf)

Notes:

1. Additional documentation is contained in Tech Brief B73-10519.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Goddard Space Flight Center
   Code 207.1
   Greenbelt, Maryland 20771
   Reference: TSP73-10515

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,759,746). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
Goddard Space Flight Center
Code 204
Greenbelt, Maryland 20771

Source: John McCallum of
Battelle Memorial Institute
under contract to
Goddard Space Flight Center
(GSC-11368)